

1. General description

Planar passivated four quadrant triac in a SOT78 plastic package intended for use in general purpose bidirectional switching and phase control applications.

2. Features and benefits

- High voltage capability
- Least sensitive gate for highest noise immunity
- High minimum IGT for guaranteed immunity to gate noise
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants

3. Applications

- General purpose motor controls
- General purpose switching

4. Quick reference data

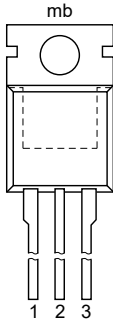

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	600	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 125\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	16	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$; $t_{\text{p}} = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	155	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$; $t_{\text{p}} = 16.7\text{ ms}$	-	-	170	A
T_{j}	junction temperature		-	-	150	°C
Static characteristics						
I_{GT}	gate trigger current	$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2+ G+; $T_{\text{j}} = 25\text{ °C}$; Fig. 7	10	-	50	mA
		$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2+ G-; $T_{\text{j}} = 25\text{ °C}$; Fig. 7	10	-	50	mA
		$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2- G-; $T_{\text{j}} = 25\text{ °C}$; Fig. 7	10	-	50	mA
		$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; T2- G+; $T_{\text{j}} = 25\text{ °C}$; Fig. 7	10	-	100	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9	-	-	60	mA
V_T	on-state voltage	$I_T = 20\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10	-	1.2	1.6	V
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$; $T_j = 150\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit	200	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 150\text{ }^\circ\text{C}$; $I_{T(RMS)} = 16\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit	2	8	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 <p>TO-220AB (SOT78)</p>	 <p>sym051</p>
2	T2	main terminal 2		
3	G	gate		
mb	n.c.	mounting base; main terminal 2		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT139-600G0T	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

7. Marking

Table 4. Marking codes

Type number	Marking code
BT139-600G0T	BT139-600G0T

8. Limiting values

Table 5. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{DRM}	repetitive peak off-state voltage		-	600	V
I _{T(RMS)}	RMS on-state current	full sine wave; T _{mb} ≤ 125 °C; Fig. 1; Fig. 2; Fig. 3	-	16	A
I _{TSM}	non-repetitive peak on-state current	full sine wave; T _{j(init)} = 25 °C; t _p = 20 ms; Fig. 4; Fig. 5	-	155	A
		full sine wave; T _{j(init)} = 25 °C; t _p = 16.7 ms	-	170	A
I ² t	I ² t for fusing	t _p = 10 ms; sine-wave pulse	-	120	A ² s
dI _T /dt	rate of rise of on-state current	I _G = 0.2 A	-	50	A/μs
		I _G = 0.2 A	-	50	A/μs
		I _G = 0.2 A	-	50	A/μs
		I _G = 0.2 A	-	10	A/μs
I _{GM}	peak gate current		-	2	A
P _{GM}	peak gate power		-	5	W
P _{G(AV)}	average gate power	over any 20 ms period	-	0.5	W
T _{stg}	storage temperature		-40	150	°C
T _j	junction temperature		-	150	°C

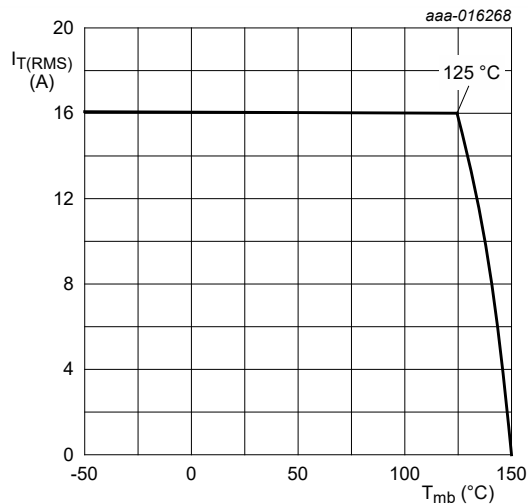


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values

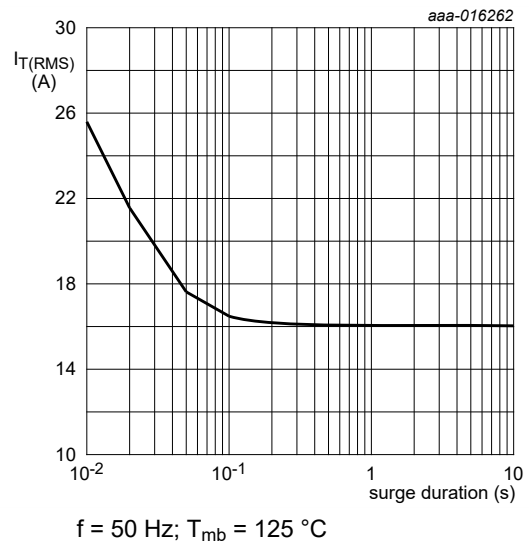
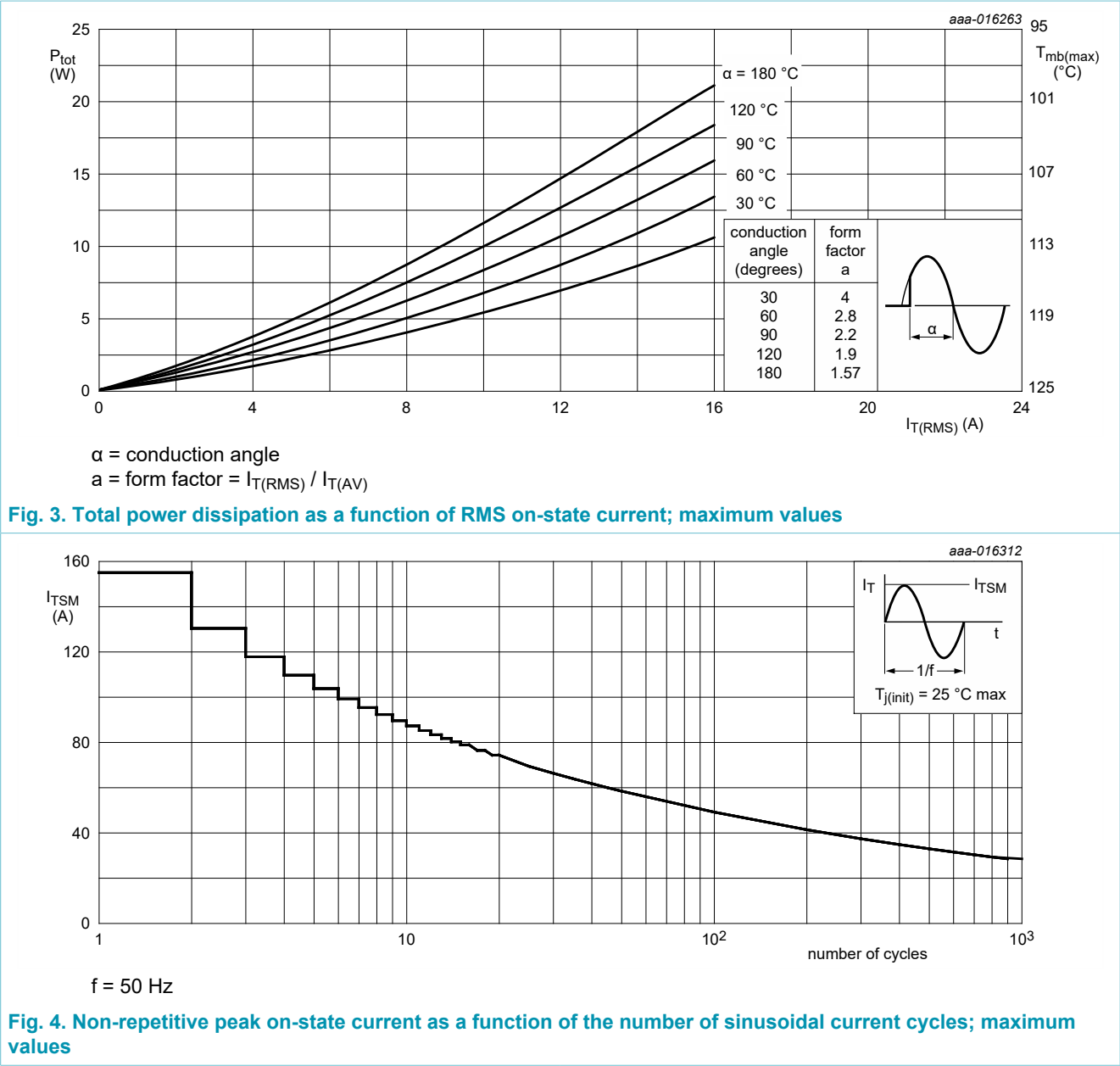
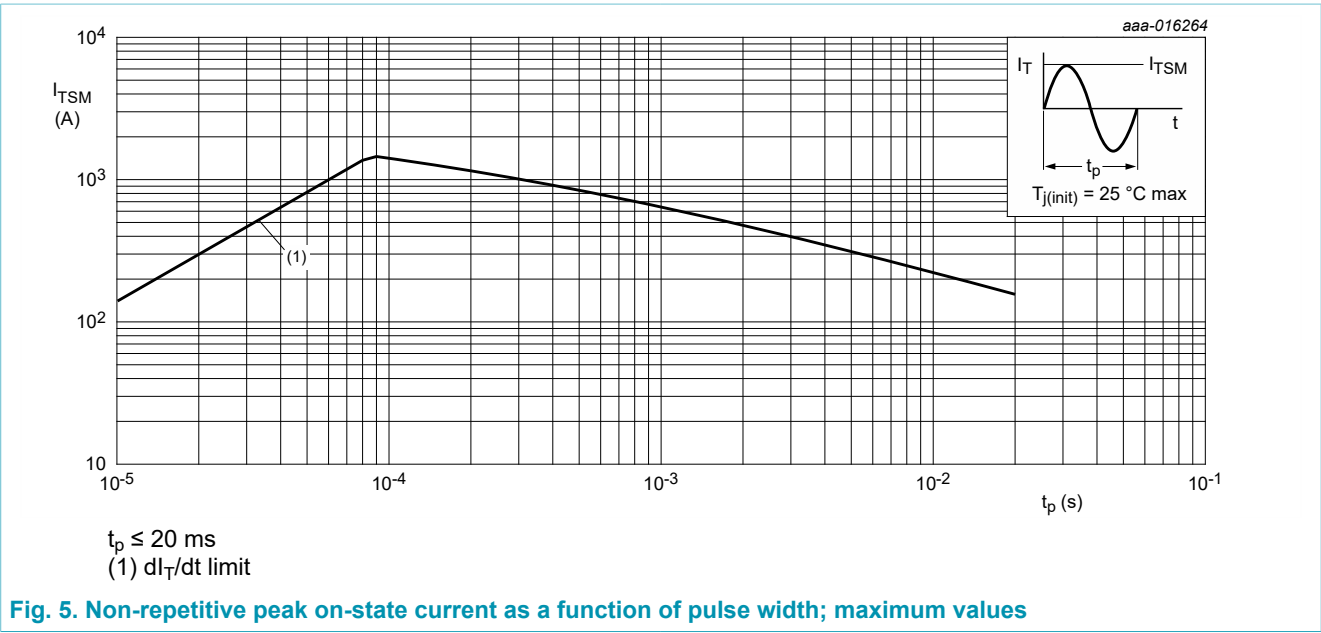


Fig. 2. RMS on-state current as a function of surge duration; maximum values
f = 50 Hz; T_{mb} = 125 °C

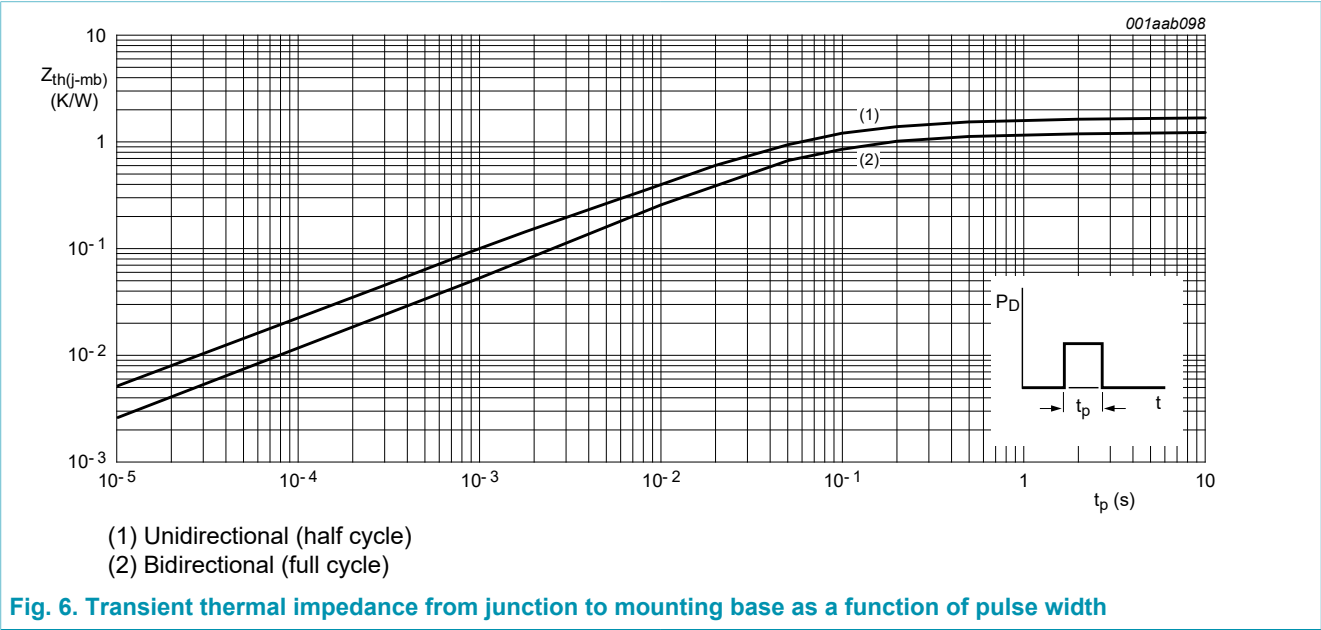




9. Thermal characteristics

Table 6. Thermal characteristics

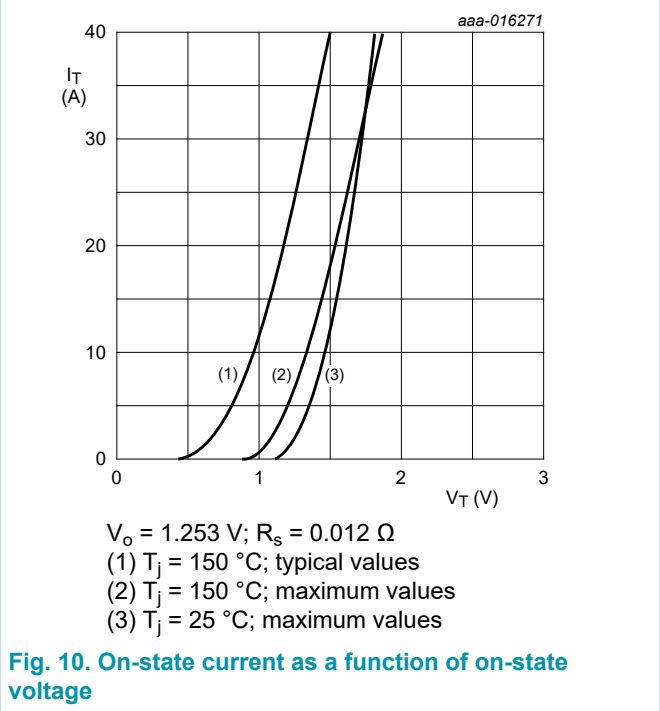
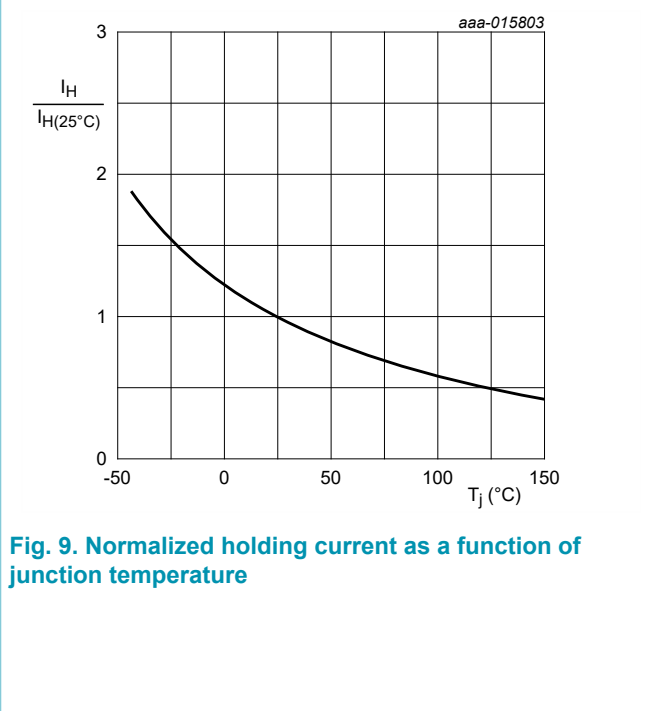
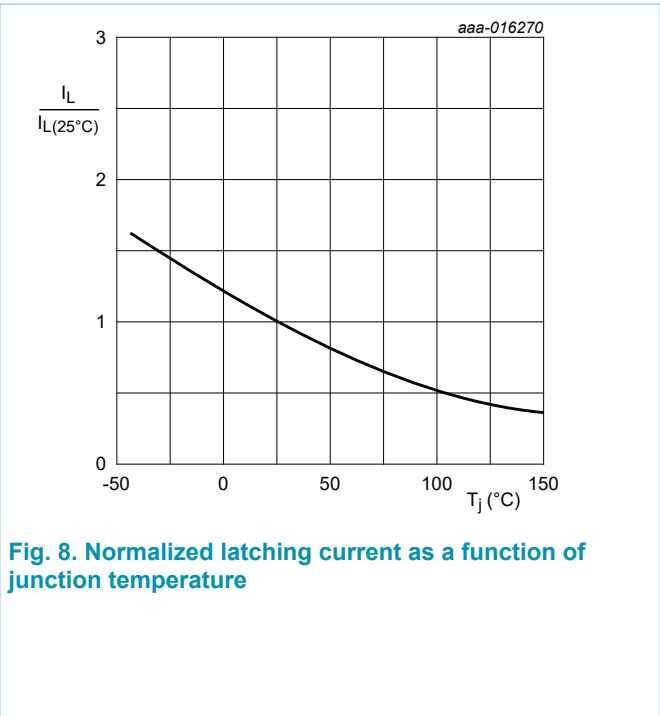
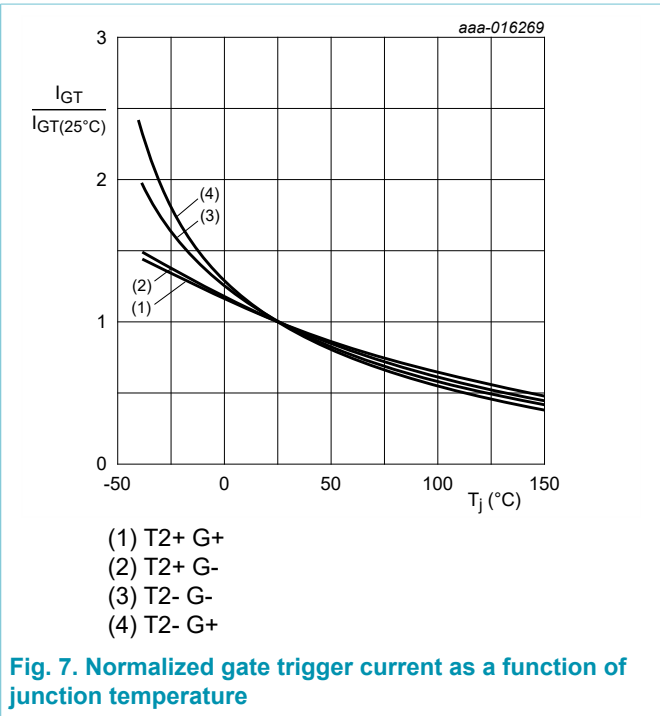
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig. 6	-	-	1.2	K/W
		half cycle	-	-	1.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I _{GT}	gate trigger current	V _D = 12 V; I _T = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 7		10	-	50	mA
		V _D = 12 V; I _T = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 7		10	-	50	mA
		V _D = 12 V; I _T = 0.1 A; T2- G-; T _j = 25 °C; Fig. 7		10	-	50	mA
		V _D = 12 V; I _T = 0.1 A; T2- G+; T _j = 25 °C; Fig. 7		10	-	100	mA
I _L	latching current	V _D = 12 V; I _G = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 8		-	-	60	mA
		V _D = 12 V; I _G = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 8		-	-	90	mA
		V _D = 12 V; I _G = 0.1 A; T2- G-; T _j = 25 °C; Fig. 8		-	-	60	mA
		V _D = 12 V; I _G = 0.1 A; T2- G+; T _j = 25 °C; Fig. 8		-	-	90	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; Fig. 9		-	-	60	mA
V _T	on-state voltage	I _T = 20 A; T _j = 25 °C; Fig. 10		-	1.2	1.6	V
V _{GT}	gate trigger voltage	V _D = 12 V; I _T = 0.1 A; T _j = 25 °C; Fig. 11		-	0.7	1	V
		V _D = 400 V; I _T = 0.1 A; T _j = 150 °C; Fig. 11		0.25	0.4	-	V
I _D	off-state current	V _D = 600 V; T _j = 25 °C		-	-	10	μA
		V _D = 600 V; T _j = 150 °C		-	0.4	2	mA
Dynamic characteristics							
dV _D /dt	rate of rise of off-state voltage	V _{DM} = 402 V; T _j = 150 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit		200	-	-	V/μs
dI _{com} /dt	rate of change of commutating current	V _D = 400 V; T _j = 150 °C; I _{T(RMS)} = 16 A; dV _{com} /dt = 20 V/μs; (snubberless condition); gate open circuit		2	8	-	A/ms
t _{gt}	gate-controlled turn-on time	I _{TM} = 20 A; V _D = 600 V; I _G = 0.1 mA; dI _G /dt = 5 A/μs		-	2	-	μs



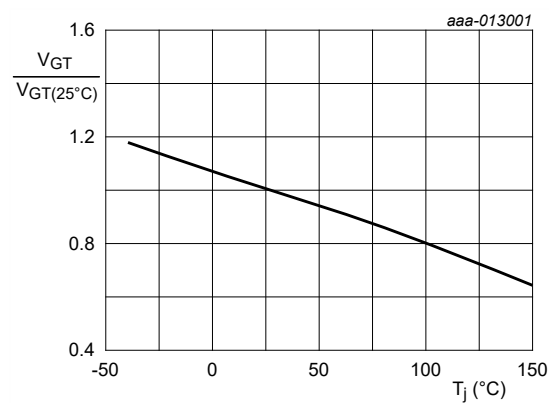


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

11. Package outline

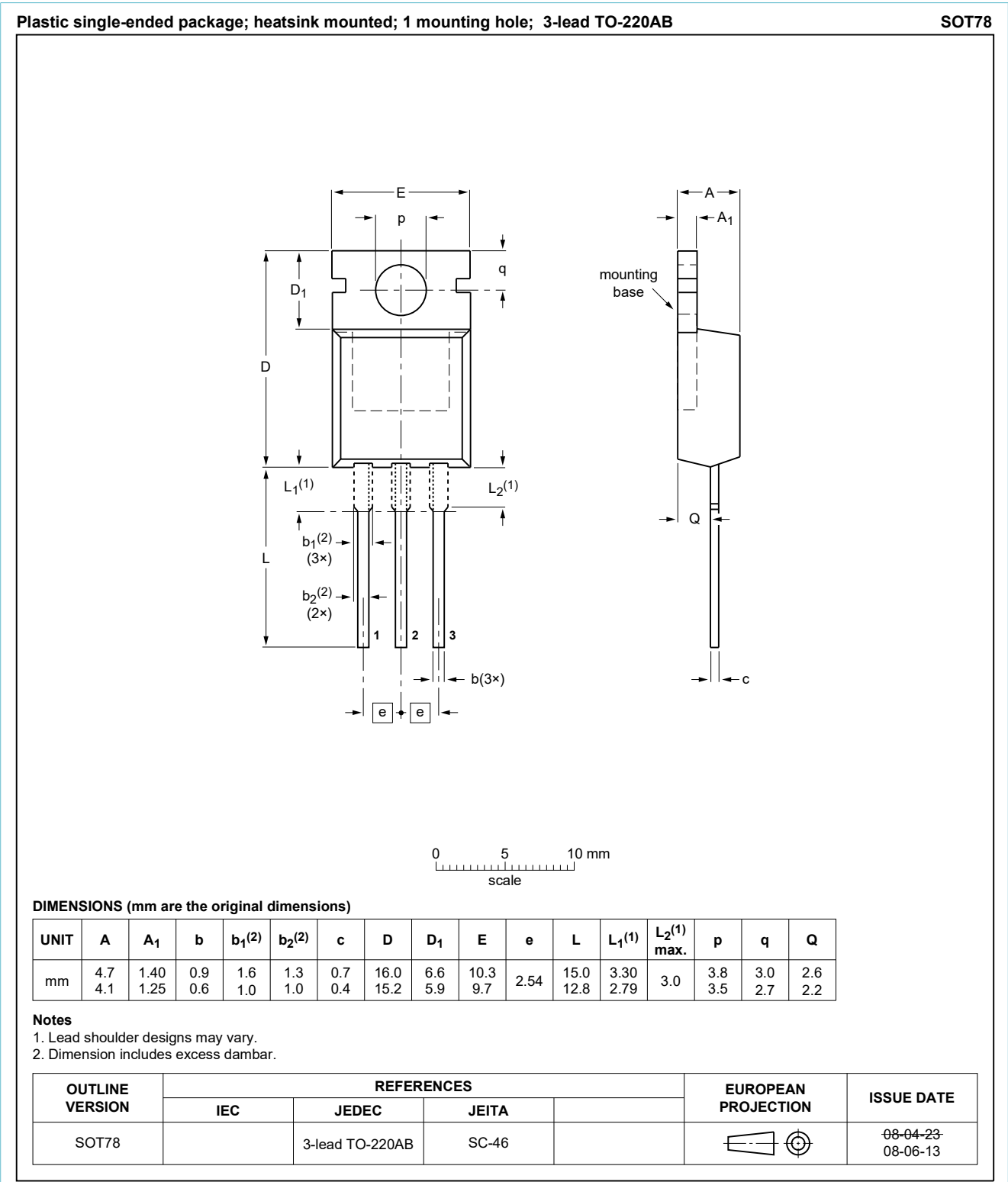


Fig. 12. Package outline TO-220AB (SOT78)

12. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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